Phototactic Behaviors of Monarchs

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Question: Are adult Monarch Butterflies, *Danaus plexippus,* attracted to light?

Hypotheses:

Adult Monarch Butterflies will fly toward any light source

Light has nothing to do with where adult Monarch Butterflies fly.

Methods: A room with no windows was used so outside light would not affect the results. Lamps with 60 watt bulbs in the were placed in the north and south corners of the room (Fig. 1.). The butterflies were released by tossing them into the air from the center of the room. The direction in which they flew or if they flew to a light was recorded. For the first trial all the lights in the room were on to see if they flew randomly with fairly even light. For the second trial only the light in the south corner was on. For the third trial only the light in the north corner was on. For the final trial both the lights were on. Ten monarchs were used in each trial though some trials were repeated giving a larger sample size. Any Monarchs that did not fly as far as a wall were not recorded.

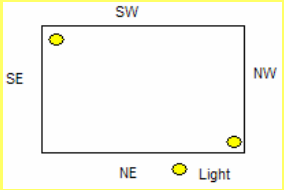

Fig. 1. The lights were placed in the N and S corners.

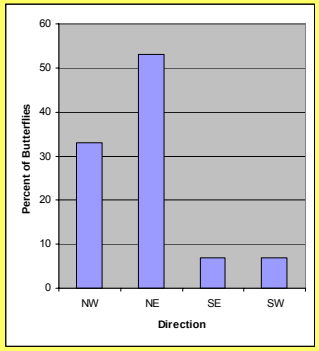

Fig. 2. Trial 1: The Monarchs tended to fly toward the NW and NE walls (χ^2=19.2, p<0.005).

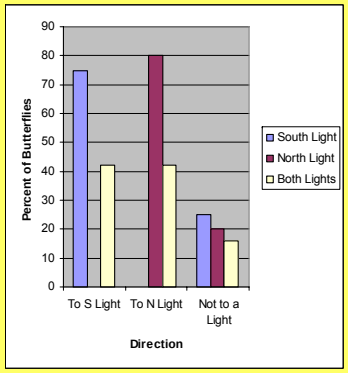

Fig. 3. Trials 2-4: The Monarchs tended to fly toward the lights.

Results: In the first trial with even light throughout the room, it was found to be significant that the Monarchs tended to fly toward the NW and NE walls (Fig. 2.). A chi square test was done on the results of this test with a result of 19.2 meaning that these results are significant and not random. This could be due to an attraction to the large white boards on these walls. In the trials with either the south or north light on, the majority of the Monarchs flew toward the light. In the trial with both the south and north lights on the majority of the Monarchs flew to one of the lights with no obvious preference to direction (Fig. 3.). These results were obvious and no statistical test was used.

Conclusions: From the results of this experiment it can be said that Monarch Butterflies are phototactic, attracted to light. There are several possible reasons for this behavior. It could be a survival tactic, looking for light, normally sunlight in the wild, for a source of warmth (Markow 1979). It is also possible that they use the sun when migrating, a sun compass (Taylor 2000), and so would be attracted to its light. Some other aspects to look at when it comes to phototactic behaviors would be attraction to certain wavelengths (Hirabayashi 1993), the effects of temperature (Markow 1979), among other factors such as light height and intensity. Also experiments testing what allows Monarchs to migrate the correct direction could be useful.

References

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